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(54) **FLOATING FLAP GATE**

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(58) **Field of Classification Search**
CPC E02B 7/205; E02B 7/40; E02B 7/42; E02B 3/104
USPC 405/87, 92, 94, 96, 99, 100
See application file for complete search history.

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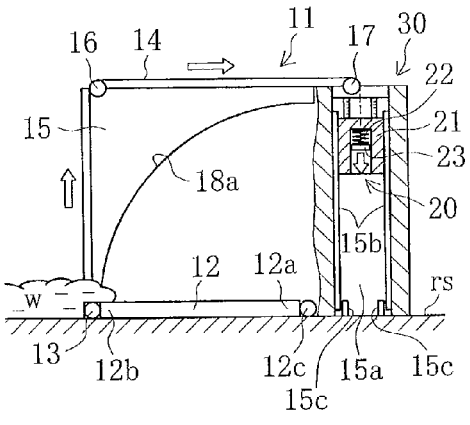
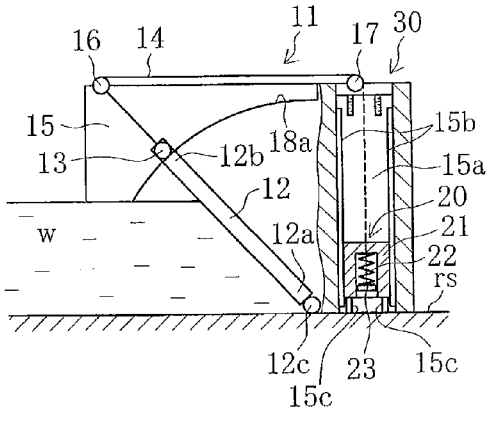
(74) *Attorney, Agent, or Firm* — Brinks Gilson & Lione

(57) **ABSTRACT**

The present invention provides a floating flap gap which has a door body with a forward end which is able to swing upwards, in a direction in which the water flows into an opening or at an access way, around a base end thereof serving as a fulcrum. The door body is attached to one end of a wire rope, and an auxiliary force generating means is attached to the other end thereof. This structure makes it possible to prevent an overflow during the initial influx of water and to enhance the ability of the door body to follow the water level when the door body begins to lower. This structure additionally makes it possible to mitigate a shock which occurs when raising of the door body is completed and when lowering of the door body is completed.

3 Claims, 7 Drawing Sheets





(51) **Int. Cl.**

E02B 7/44	(2006.01)
E02B 7/02	(2006.01)
E02B 3/10	(2006.01)

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Fig.1

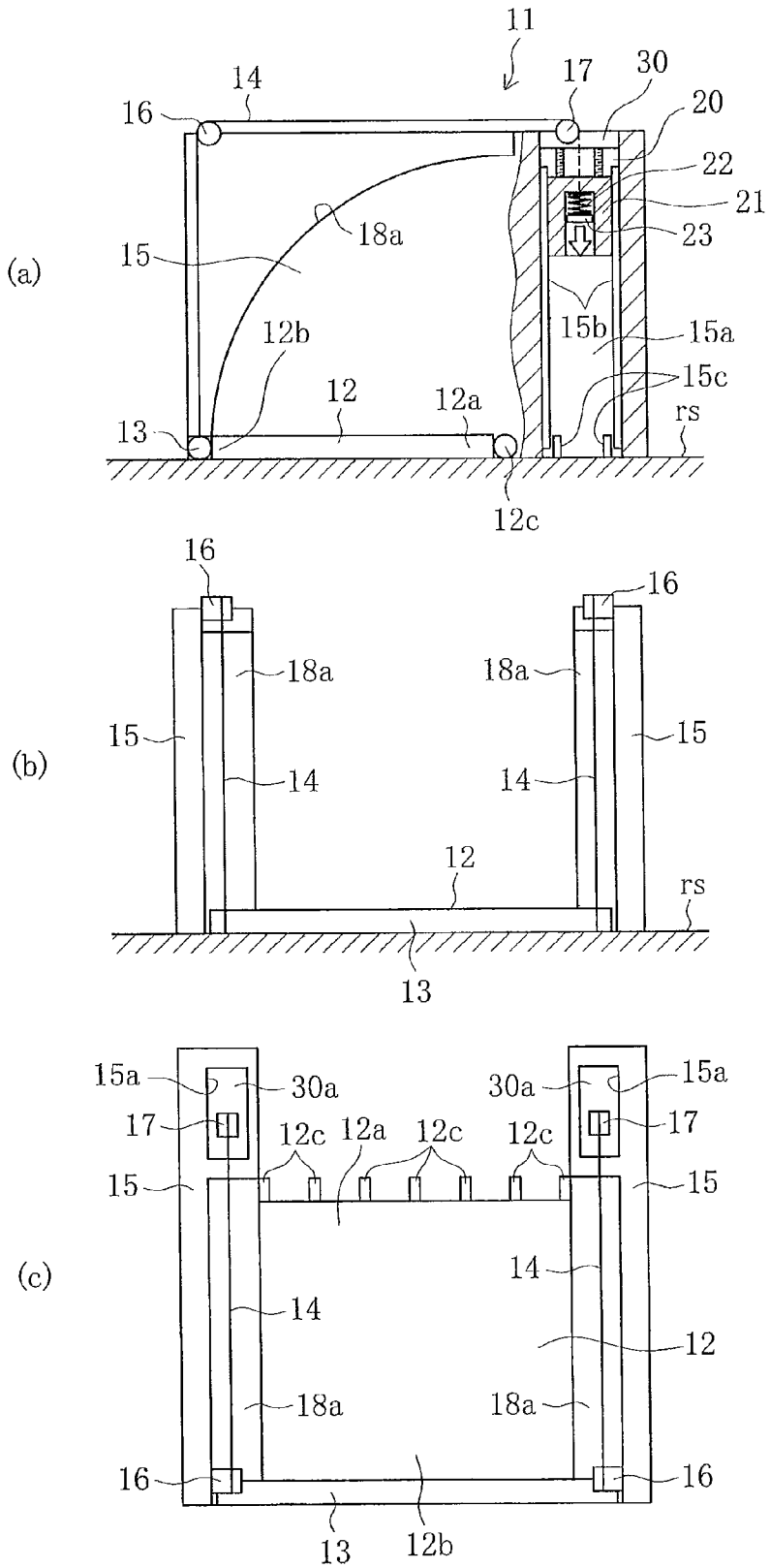

(a)
11
14
16
17
30
20
22
21
23
18a
15
12b
15b
15a
15c
12
12a
13
rs
12c
(b)
16
16
18a
18a
15
15
14
14
12
rs
13
(c)
15a
30a
30a
15a
17
12c
12a
12c
12c
17
15
15
14
14
12
18a
18a
16
16
13
12b

Fig.2

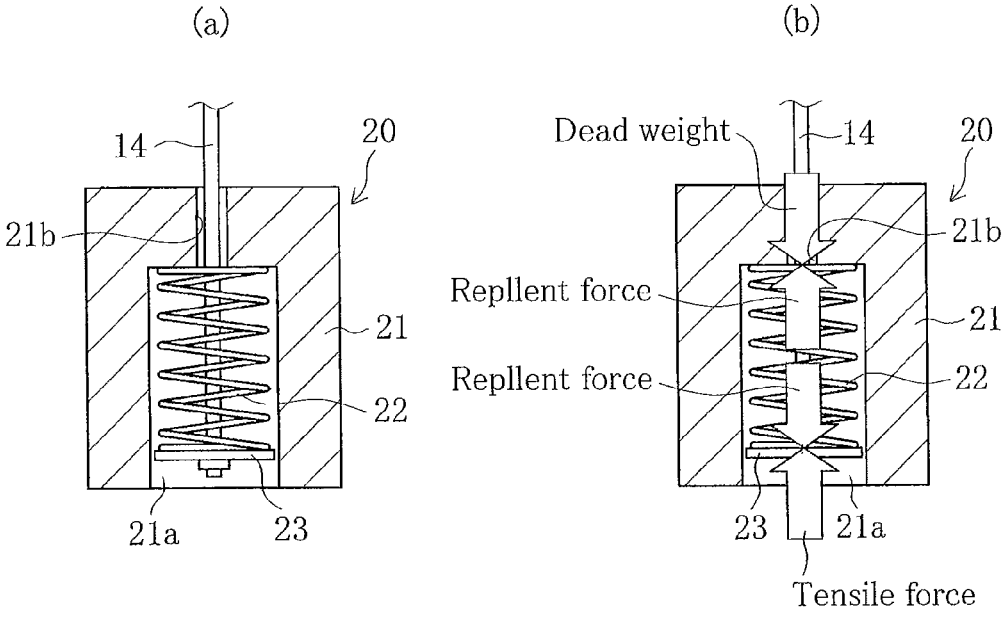

(a)
(b)
14
20
21b
21
22
21a
23
Dead weight
Repllent force
Repllent force
Tensile force

Fig.3

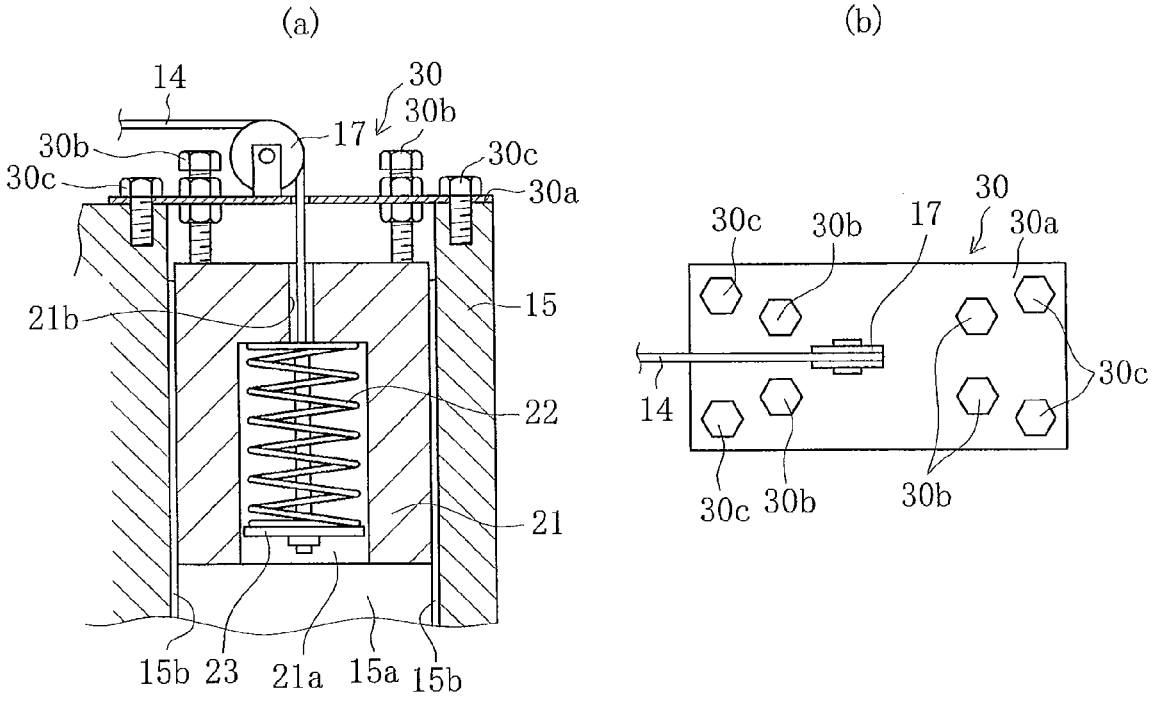

(a)
(b)
14
30
30b
17
30c
30a
21b
15
22
21
15b
23
21a
15a
15b

Fig.4

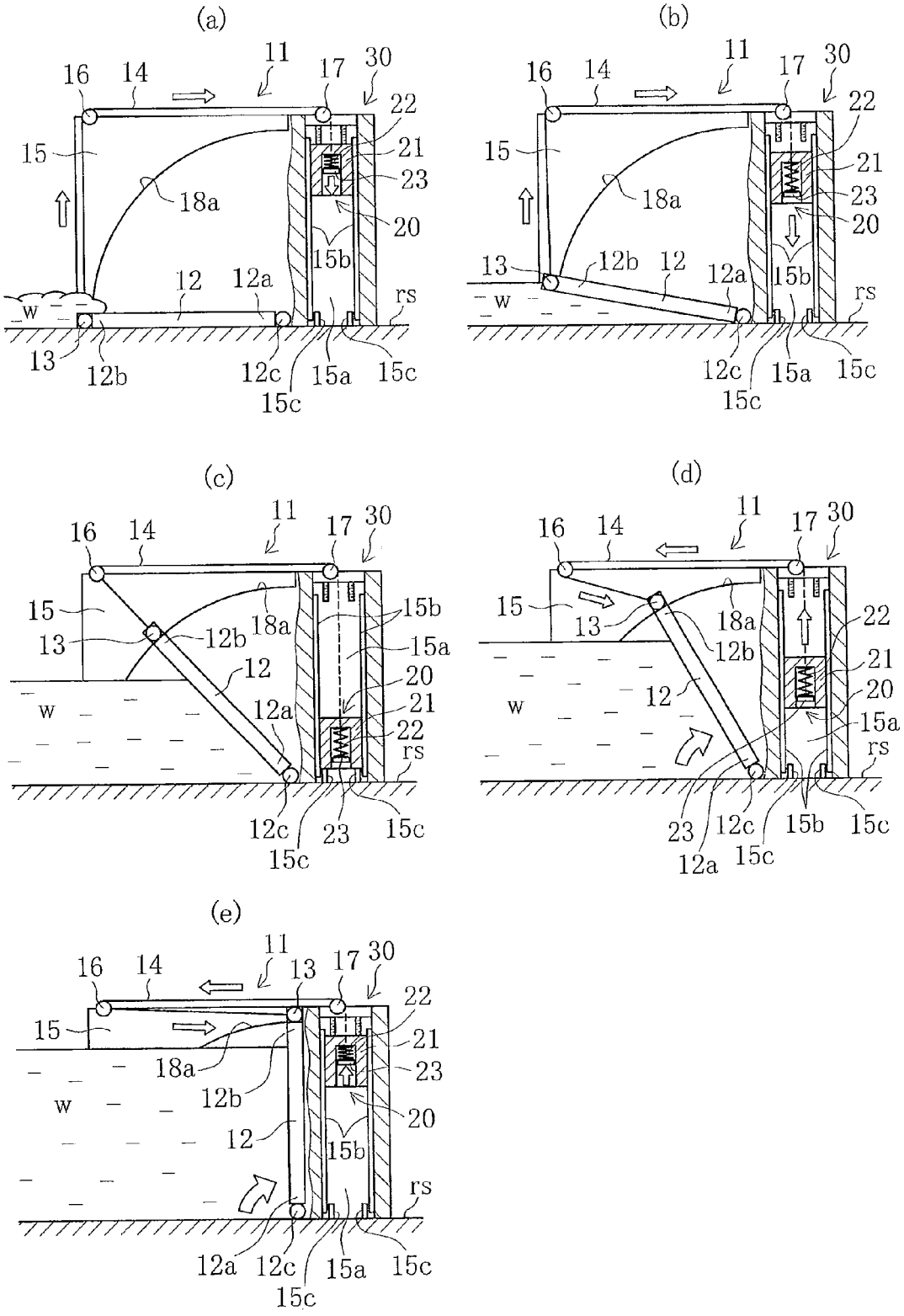

(a)
(b)
(c)
(d)
(e)
11
13
14
15
16
17
18a
20
21
22
23
30
12
12a
12b
12c
15a
15b
15c
rs
w

Fig.5

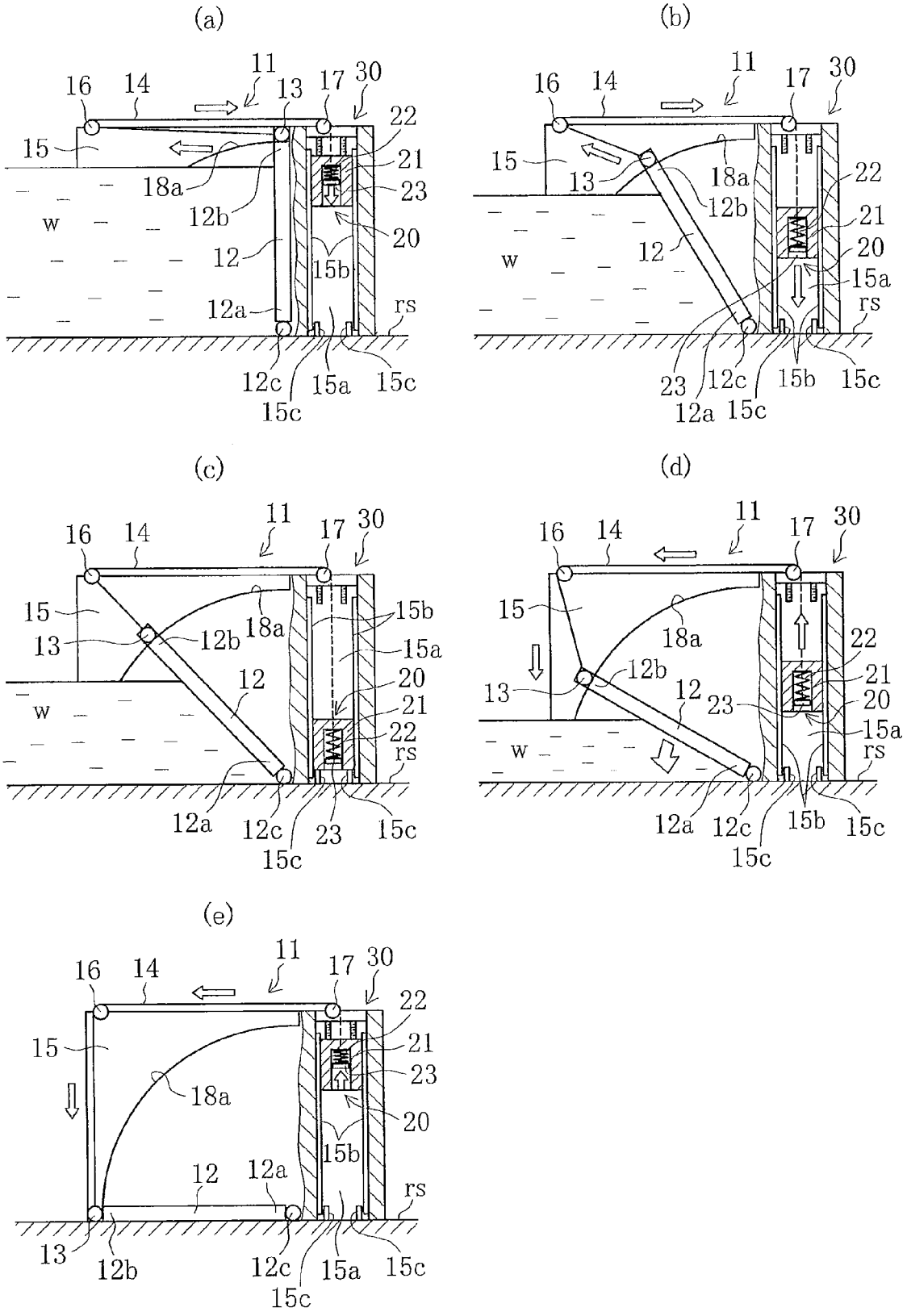

(a)
(b)
(c)
(d)
(e)
11
16
14
13
17
30
22
21
23
20
15
18a
12b
12
15b
12a
rs
w
12c
15a
15c

Fig.6

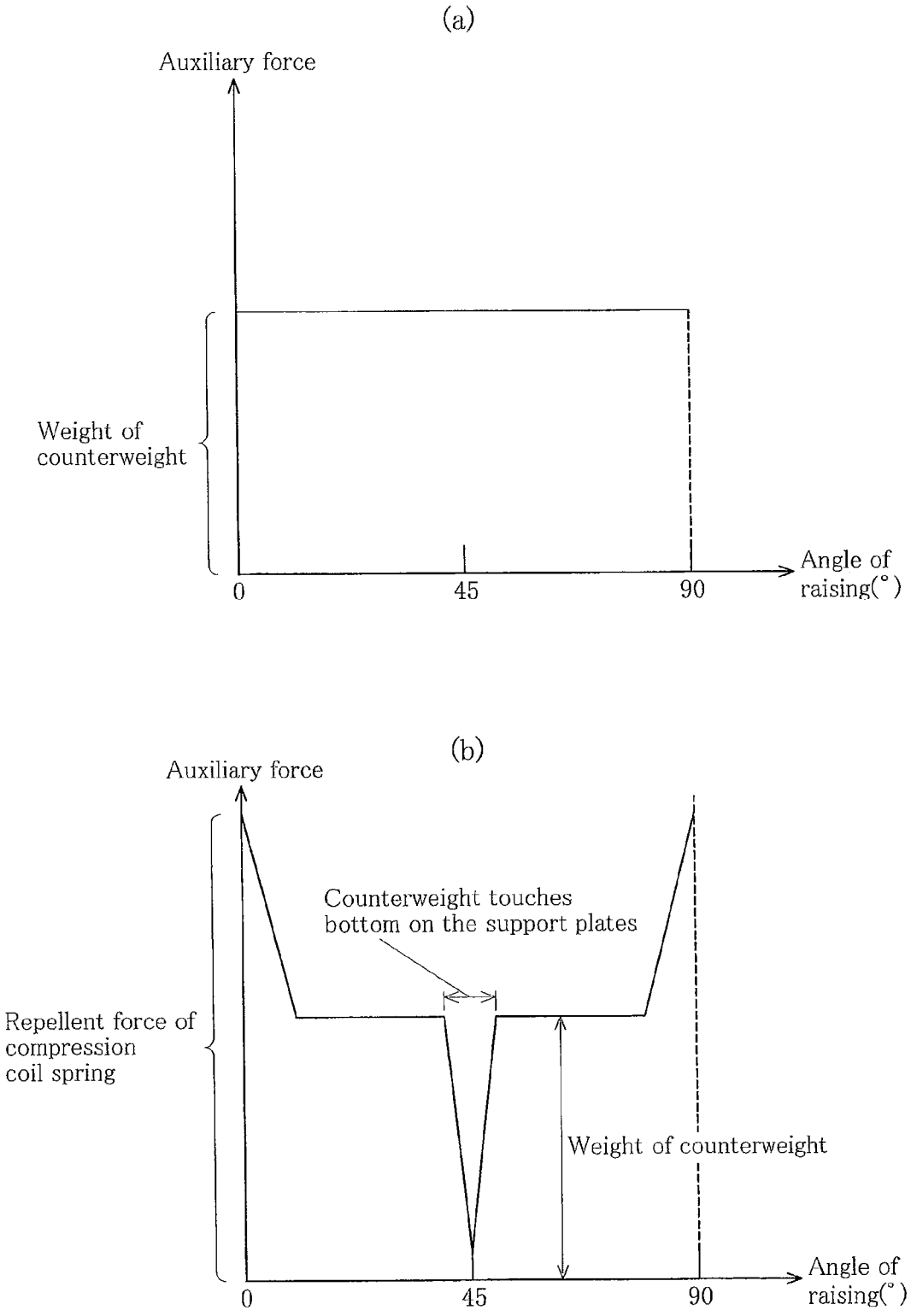

(a)
Auxiliary force
Weight of counterweight
0
45
90
Angle of raising(°)
(b)
Auxiliary force
Counterweight touches bottom on the support plates
Repellent force of compression coil spring
Weight of counterweight
0
45
90
Angle of raising(°)

Fig.7

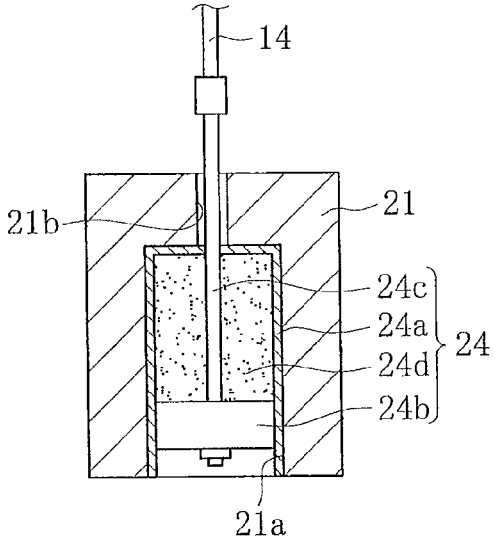


Fig.8

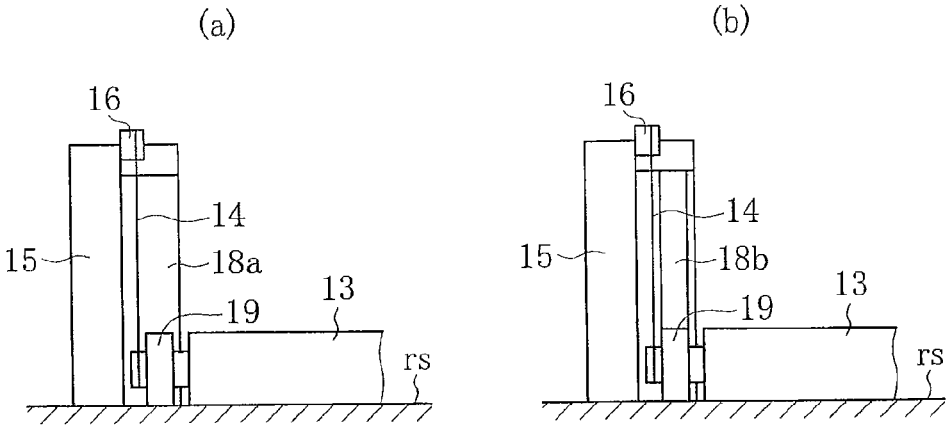


Fig.9

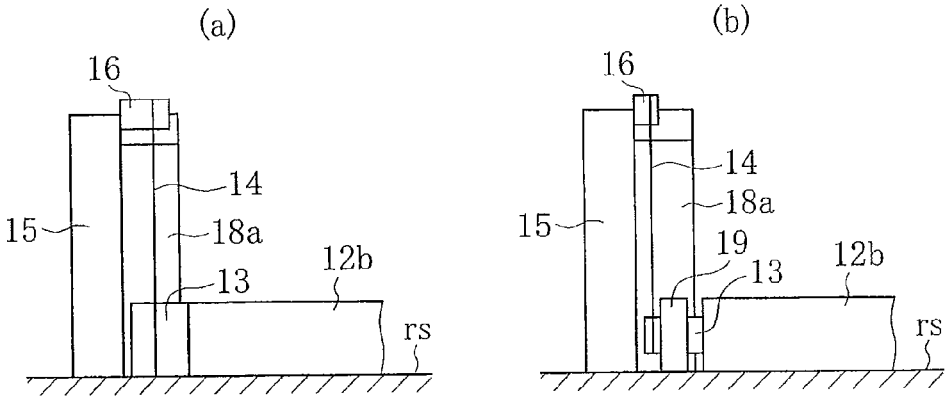
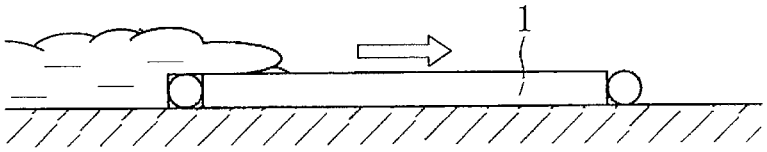
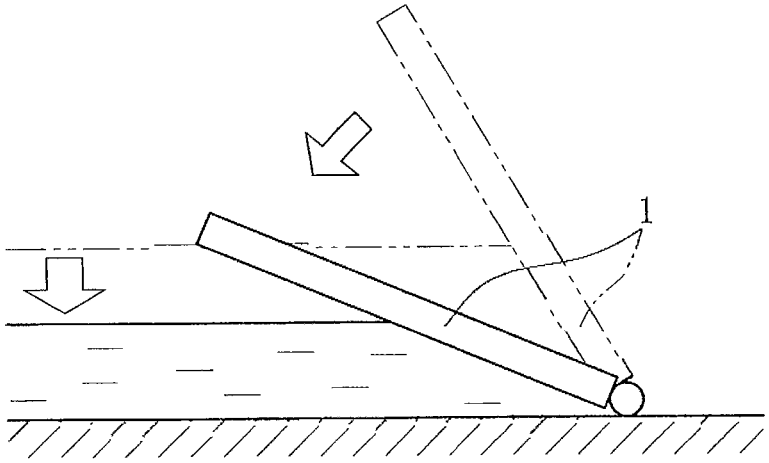


Fig.10
Prior Art

(a)



(b)



FLOATING FLAP GATE

This application is a 371 application of PCT/JP2012/79294 having an international filing date of Nov. 12, 2012, which claims priority to JP2012-6512 filed Jan. 16, 2012, the entire contents of which are incorporated herein by reference.

TECHNICAL FIELD

The present invention relates to a floating flap gate which is disposed at an opening in a seawall in order to prevent a rising water from flowing into living spaces or underground spaces at a time of rising water, by causing a door body to float to block the opening.

BACKGROUND ART

A floating flap gate exists which is disposed at an opening of a seawall and blocks the opening at the time of a rising water in order to prevent the rising water from flowing into living spaces or underground spaces, by causing a door body to float, using a buoyancy of the water which is trying to flow in (e.g., Patent Reference 1).

However, the floating flap gate disclosed in Patent Reference 1 has a problem in that if a speed of the inflowing water is rapid, the floating action of a door body **1** is delayed, resulting in an overflow of water into living spaces or underground spaces (see FIG. **10**(*a*)).

In addition, when the water level drops, the door body **1** stays at a raised state up to a water level which is about ⅓ the height of the door body **1**, and subsequently exhibits a hazardous behavior such as suddenly falling (see FIG. **10**(*b*)).

In order to prevent the problem of overflow during the initial influx of water, there was proposed a floating flap gate with a rope having a counterweight attached to one end, and with the other end connected to the door body via a pulley (e.g., Patent Reference 2).

The floating flap gate disclosed in Patent Reference 2 solves the problem of the delayed floating action of the door body during the initial influx of water by compensating for an insufficient buoyancy of the floating flap gate by using the weight of a counterweight.

However, the floating flap gate disclosed in Patent Reference 2 does not readily lower when the water level drops, because weight of the counterweight continually operates in a direction which assists in the floating action of the door body.

Moreover, in order to avoid a sudden falling action, which was one of the problems described above, a system was disclosed in Patent Reference 3, which employs a damper circuit to dampen the falling speed while the door body is being lowered. However, in the case of the system disclosed in Patent Reference 3, there is a risk of generating an overflow at the time of an initial influx, because the damper circuit dampens the rising speed while the door body is rising.

Patent Reference 1: Japanese Patent Application Kokai Publication No. 2001-214425

Patent Reference 2: Japanese Patent Application Kokai Publication No. 2003-253912

Patent Reference 3: Japanese Patent No. 4,388,494

SUMMARY OF THE INVENTION

Problems to be Solved by the Invention

One problem which the present invention aims to solve is that it becomes difficult to lower the door body when the water level drops, if a device is installed to continually assist the floating action of the door body with the intention of solving the problem of a floating flap gate of the prior art. Another problem is the risk of generating an overflow at the time of the initial influx, if a damper circuit is installed to dampen the falling speed while the door body is being lowered.

Means for Solving These Problems

The present invention was devised with the object of increasing a speed of operation of the door body at the time of the initial influx (when the door body starts to rise) and when the door body begins to lower, and the present invention was devised with the object of mitigating a shock which occurs when raising of the door body is completed and when lowering of the door body is completed. A further object of the present invention is to make it possible to set the door body so that it will float at any water level.

The floating flap gate according to the present invention is a floating flap gate which is disposed at an opening or at an access way, so as to block the opening or the access way when water flows in, having as its most essential features:

a door body with a forward end which is able to swing upwards, in a direction in which the water flows in and within a plane in a height direction, around a base end thereof serving as a fulcrum; and

an auxiliary force generating means attached to one end of a rope, the other end of which is attached to the door body, the auxiliary force generating means comprising:

a counterweight inside which is formed a space,

an elastic member disposed in the space within the counterweight, so that when a compressive force operates, the elastic member reacts to the compressive force, and tries to return to its original state, and

a presser plate connected to the one end of the rope passing through a central portion of the elastic member disposed within the space via a hole formed in a ceiling of the counterweight, the presser plate being brought into contact with a lower surface of the elastic member to cause the compressive force to operate on the elastic member.

The present invention operates as described below, by employing an auxiliary force generating means which has a configuration in which a presser plate connected to the other end of the rope passing through a central portion of the elastic member via a hole formed in a ceiling of the counterweight, is brought into contact with a lower surface of the elastic member disposed in a space formed within the counterweight.

When the door body starts to rise, the rising speed of the door body increases, because the rope is pulled by the repellent force of the elastic member, but the rising speed of the door body decreases at the final stage of raising of the door body, because an auxiliary force is generated by the repellent force of the elastic member before the door body finishes rising.

When the door body starts to lower, the rope is pulled and the falling speed of the door body increases, because an auxiliary force is generated by the repellent force of the elastic member, but the falling speed of the door body decreases at the final stage of lowering of the door body, because an auxiliary force is generated by the repellent force of the elastic member before lowering of the door body is completed.

If the above-described present invention is further provided with a height position adjustment mechanism for adjusting the height position at the highest point of the auxiliary force

generating means, it becomes possible to adjust the initial auxiliary force of the elastic member.

Advantageous Effects of the Invention

According to the present invention, at the initial stage of raising the door body, it is possible to increase the rising speed of the door body and to prevent an overflow during the initial influx of water, because the rope is pulled by the repellent force of the elastic member. On the other hand, a shock which occurs when raising of the door body is completed can be mitigated because an auxiliary force is generated by the repellent force of the elastic member before raising of the door body is completed, so that the rising speed of the door body decreases at the final stage of raising of the door body.

When the door body begins to lower, an auxiliary force is generated by the repellent force of the elastic member, pulling the rope, and increasing the falling speed of the door body, thus enhancing the ability of the door body to follow the water level. On the other hand, before lowering of the door body is completed, an auxiliary force is generated by the repellent force of the elastic member, decreasing the lowering speed of the door body at the final stage of lowering of the door body, thus making it possible to mitigate the shock which occurs when lowering of the door body is completed.

If the above-described present invention is further provided with a height position adjustment mechanism for adjusting the height position at the highest point of the auxiliary force generating means, it becomes possible to adjust the initial auxiliary force of the elastic member, thus making it possible to set the door body so that it will float at any water level.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a schematic structural drawing of the floating flap gate according to the present invention, where FIG. **1**(*a*) is a side view, FIG. **1**(*b*) is a front view, and FIG. **1**(*c*) is a planar view.

FIG. **2** is a drawing illustrating a case where a compression coil spring is used as the elastic member which is a structural element of the auxiliary force generating means of the floating flap gate according to the present invention, where FIG. **2**(*a*) is an enlarged view of the structure, and FIG. **2**(*b*) is a drawing illustrating the forces operating on the compression coil spring during operation.

FIG. **3** is a drawing illustrating a height position adjustment mechanism for adjusting the height position at the highest point of the auxiliary force generating means of the floating flap gate according to the present invention, where FIG. **3**(*a*) is a front view, and FIG. **3**(*b*) is a planar view.

FIG. **4** is a drawing illustrating the operating principle during raising of the floating flap gate according to the present invention, where FIG. **4**(*a*) is an initial stage of influx of water, FIG. **4**(*b*) is an initial stage of raising the door body, FIG. **4**(*c*) is an intermediate stage of raising the door body, FIG. **4**(*d*) is a final stage of raising the door body, and FIG. **4**(*e*) is a stage when raising the door body is completed.

FIG. **5** is a drawing illustrating the operating principle during lowering of the floating flap gate according to the present invention, where FIG. **5**(*a*) is when lowering of the door body starts, FIG. **5**(*b*) is an initial stage of lowering the door body, FIG. **5**(*c*) is an intermediate stage of lowering the door body, FIG. **5** (*d*) is a final stage of lowering the door body, and FIG. **5**(*e*) is a stage when lowering the door body is completed.

FIG. **6** is a drawing illustrating the relationship between the angle of raising of the door body of the floating flap gate and the auxiliary force, where FIG. **6**(*a*) is a case in which only a counterweight is used, and FIG. **6**(*b*) is a case in which a counterweight and a compression coil spring are used.

FIG. **7** is a drawing illustrating a case where a gas cylinder is used as the elastic member which is a structural element of the auxiliary force generating means of the floating flap gate according to the present invention.

FIG. **8**(*a*) is a drawing illustrating a portion of a floating flap gate according to the present invention corresponding to a portion where a wheel is attached to a rod, and FIG. **8**(*b*) is a drawing illustrating a case where a rail is added to the structure of FIG. **8**(*a*).

FIG. **9**(*a*) is a drawing illustrating of a portion of a floating flap gate according to the present invention corresponding to a portion where the rod is optionally attached to both sides of the door body, and FIG. **9**(*b*) is a drawing illustrating a case where a wheel is added to the structure of FIG. **9**(*a*).

FIG. **10** is a drawing illustrating the problems of the floating flap gate according to the prior art. FIG. **10**(*a*) illustrates the initial stage of influx, and FIG. **10**(*b*) illustrates a time when the water level has dropped.

PREFERRED EMBODIMENT

According to the present invention, the object of increasing the speed of operation of the door body at the initial stage of influx or when the door body begins to lower, and the object of mitigating the shock which occurs when raising of the door body is completed and when lowering of the door body is completed, are achieved by providing an auxiliary force generating means which has a configuration in which a presser plate connected to the other end of the rope passing through a central portion of the elastic member via a hole formed in the ceiling of the counterweight, is brought into contact with a lower surface of the elastic member disposed in a space formed within the counterweight.

EXAMPLE

An example of the present invention is described in detail below using FIG. **1** to FIG. **6**.

FIG. **1** is a schematic structural drawing of the floating flap gate according to the present invention.

In FIG. **1**, Reference Numeral **11** is a floating flap gate according to the present invention which is disposed on a channel surface rs at an opening in a seawall, for example. When a water w tries to flow from an ocean (or from a river) into a living space or an underground space, the floating flap gate **11** uses the pressure of the in-flowing water w to swing a forward end **12***b* of a door body **12** upwards around a rotating shaft **12***c* of a base end **12***a* as a fulcrum, to block the opening in a water-tight manner. Reference Numeral **18***a* represents guides formed on door bumpers **15** to guide the door body **12** as it swings upwards.

If there is a wide opening to be blocked by the door body **12** of the floating flap gate **11**, then a plurality of door bodies **12** may be linked width-wise at the opening, and the spaces between the various door bodies **12** are joined together with water-tight rubber. In addition, water-tight rubber is provided on the sides corresponding to door bumpers **15** of the door bodies **12**, which are provided at the opening of the seawall.

The floating flap gate **11** shown in FIG. **1** has, for example, a rod **13**, attached across the entire width-wise direction in the vicinity of the forward end of the door body **12**, which functions to support the load resulting from the water pressure and to attach one end of a wire rope **14**.

The other end of the wire rope **14** is attached to an auxiliary force generating means **20** disposed in a holding space **15***a* provided within the door bumpers **15**, via a first fixed pulley **16** disposed in the door bumpers **15** above the forward end of the door body **12** and a second fixed pulley **17** disposed in the door bumpers **15** above the base end side of the door body **12** when it is lowered.

As shown in FIG. **2**, for example, the auxiliary force generating means **20** moves up and down along a guide member **15***b* attached within the holding space **15***a*, and has a structure which includes a compression coil spring **22** serving as the elastic member in a space **21***a* which has an open lower portion and which is formed within a counterweight **21**, and lower surface of the compression coil spring **22** is supported by a presser plate **23**.

In addition, the presser plate **23** is connected to the other end of the wire rope **14** which passes through the central portion of the compression coil spring **22** via a hole **21***b* provided in the ceiling of the counterweight **21**.

Reference Numeral **30** is a height position adjustment mechanism for adjusting the height position at the highest point of the auxiliary force generating means **20**, and, as shown in FIG. **3**, it has a structure in which 4 machine bolts **30***b* are screwed into a mounting plate **30***a* to which is attached the second fixed pulley **17**.

Such a height position adjustment mechanism **30** makes it possible to adjust a compressive force applied to the compression coil spring **22**, by varying the height position at the highest point of the auxiliary force generating means **20** according to the penetration depth of the machine bolts **30***b* into the mounting plate **30***a* and by varying the stroke amount of the wire rope **14** which is due to the compression coil spring **22** alone. In FIG. **3**, Reference Numeral **30***c* is a bolt for affixing the mounting plate **30***a*.

The floating flap gate **11** of the present invention which has the above-described configuration exhibits the functions described below when raising and lowering the door body **12**.

When Raising the Door Body **12**: See FIG. **4**

Initial Stage of Influx of Water: See FIG. **4**(*a*)

During the initial stage of influx of water, the auxiliary force generating means **20** is positioned at the maximum upper limit, and the compression coil spring **22** is in a compressed state, so the repellent force of the compression coil spring **22** causes the wire rope **14** to pull the door body **12** in the direction of rising, thereby assisting in raising of the door body **12**. This auxiliary force decreases as the repellent force of the compression coil spring **22** decreases.

Initial Stage of Raising the Door Body: See FIG. **4**(*b*)

The compression coil spring **22** gradually expands as the door body **12** rises. When the repellent force of the compression coil spring **22** decreases until the weight of the counterweight **21** is no longer supported, the counterweight **21** starts to descend. Subsequently, the counterweight **21** is supported by the repellent force of the compression coil spring **22**, and the weight of the counterweight **21** operates on the wire rope **14** to assist in raising the door body **12**.

Intermediate Stage of Raising the Door Body: See FIG. **4**(*c*)

When the door body **12** rises to an intermediate height (where the angle of raising of the door body **12** is about 35-55°, the counterweight **21** lowers to reach support plates **15***c* which are installed within the holding space **15***a* of the door bumpers **15**. When the counterweight **21** reaches the support plates **15***c*, the load of the counterweight **21** is released from the compression coil spring **22**, resulting in the compression coil spring **22** returning to a free length and a load of 0, and a tensile force no longer operates on the wire rope **14**.

Final Stage of Raising the Door Body: See FIG. **4**(*d*)

When the door body **12** rises beyond an intermediate height, and the wire rope **14** is pulled by the rising action of the door body **12** (the water pressure operates on the door body **12**), the compression coil spring **22** is compressed. When the weight of the counterweight **21** is supported by the repellent force of the compression coil spring **22**, the counterweight **21** moves away from the support plates **15***c*, and starts to rise. Then, the counterweight **21** is supported by the repellent force of the compression coil spring **22**, and the weight of the counterweight **21** operates on the wire rope **14**, so that a sudden raising of the door body **12** is avoided.

Stage when Raising the Door Body is Completed: See FIG. **4**(*e*)

When the door body **12** approaches the maximum angle of raising, and the counterweight **21** comes into contact with the machine bolts **30***b*, reaching its highest point, the entire tensile force of the wire rope **14** operates on the compression coil spring **22**, so that the compression coil spring **22** is compressed. When this happens, an auxiliary force is generated in the direction of lowering of the door body **12**, due to the repellent force of the compression coil spring **22**, making it possible to mitigate the shock which occurs when raising of the door body is completed.

When Lowering the Door Body **12**: See FIG. **5**

When Lowering of the Door Body Starts: See FIG. **5**(*a*)

At the time when lowering of the door body **12** starts from the maximum angle of raising, the compression coil spring **22** is in a compressed state, so the wire rope **14** is pulled by the repellent force of the compression coil spring **22**, and an auxiliary force operates in the direction of lowering, to assist in lowering the door body **12**. This auxiliary force decreases as the repellent force of the compression coil spring **22** decreases.

Initial Stage of Lowering the Door Body: See FIG. **5**(*b*)

The compression coil spring **22** gradually expands as the door body **12** lowers. When the repellent force of the compression coil spring **22** decreases until the weight of the counterweight **21** is no longer supported, the counterweight **21** starts to descend. Subsequently, the counterweight **21** is supported by the repellent force of the compression coil spring **22**, and the weight of the counterweight **21** operates on the wire rope **14** to assist in lowering the door body **12**, and the door body **12** lowers in conjunction with the falling water level.

Intermediate Stage of Lowering the Door Body: See FIG. **5**(*c*)

When the door body **12** lowers to an intermediate height (where the angle of raising of the door body **12** is about 35-55°, the counterweight **21** lowers to reach support plates **15***c* which are installed within the holding space **15***a* of the door bumpers **15**. When the counterweight **21** reaches the support plates **15***c*, the load of the counterweight **21** is released from the compression coil spring **22**, resulting in the compression coil spring **22** returning to a free length and a load of 0, and a tensile force no longer operates on the wire rope **14**.

Final Stage of Lowering the Door Body: See FIG. **5**(*d*)

When the door body **12** lowers beyond an intermediate height, the wire rope **14** is pulled by the lowering action of the dead weight of the door body **12**, and the compression coil spring **22** is compressed. When the weight of the counterweight **21** is supported by the repellent force of the compression coil spring **22**, the counterweight **21** moves away from the support plates **15***c*, and starts to rise. Then, the counterweight **21** is supported by the repellent force of the compres-

sion coil spring **22**, and the weight of the counterweight **21** operates on the wire rope **14**, so that a sudden falling of the door body **12** is avoided.

Stage when Lowering the Door Body is Completed: See FIG. **5**(*e*)

When the door body **12** approaches the lowering limit, and the counterweight **21** comes into contact with the machine bolts **30***b*, reaching its highest point, the entire tensile force of the wire rope **14** operates on the compression coil spring **22**, so that the compression coil spring **22** is compressed. When this happens, an auxiliary force is generated in the direction of raising of the door body **12**, due to the repellent force of the compression coil spring **22**, so as to mitigate the shock which occurs when lowering of the door body is completed.

The floating flap gate **11** according to the present invention described above makes it possible to assist the door body **12** when it is being raised and lowered, to mitigate shock, and to follow the water level, by employing the auxiliary force generating means **20** which uses the counterweight **21** and the compression coil spring **22** to implement a plurality of functions.

The floating flap gate **11** according to the present invention, which has the auxiliary force generating means **20** which uses the counterweight **21** and the compression coil **22**, is able to increase the auxiliary force in the vicinity of raising limit of the door body **12** and in the vicinity of lowering limit of the door body **12**, as shown in FIG. **6**(*b*). When the angle of raising of the door body **12** is around 45°, the counterweight **21** reaches the support plates, and the compression coil spring **22** gradually expands. FIG. **6**(*b*) shows that when the angle of raising of the door body **12** is 45°, the compression coil spring **22** gradually expands until the repellent force becomes zero, but the compression coil spring **22** does not have to expand until the repellent force becomes zero.

If the auxiliary force generating means **20** is formed from only the counterweight **21**, the auxiliary force consists of only the weight of the counterweight **21**, so the auxiliary force remains constant, as shown in FIG. **6**(*a*), regardless of the angle of raising of the door body **12**.

In addition, as shown in the example of the present invention, if the support plates **15***c* are installed, the auxiliary force can be brought to zero if the door body **12** is at an intermediary height (where the angle of raising of the door body **12** is about 35-55°, and within this range, the ability of the door body **12** to follow the water level is enhanced.

Moreover, the present invention is not limited to the above-described example, and the preferred embodiment may, of course, be advantageously modified within the scope of the technical ideas recited in the claims.

For example, in the above described example, the auxiliary force generating means **20** employed both the counterweight **21** and the compression coil spring **22**, but it is also possible to employ the counterweight **21** and a gas cylinder **24**, as shown in FIG. **7**.

In this case, the gas cylinder **24**, which is formed from a cylinder **24***a* and a piston **24***b* as well as a rod **24***c*, is provided in the space **21***a* of the counterweight **21**, and a gas **24***d* at a pressure greater than atmospheric pressure is sealed within the cylinder **24***a* on the side of the rod **24***c* which is sealed by the piston **24***b*. The rod **24***c* is caused to protrude through the hole **21***b* of the counterweight **21**, connecting to the wire rope **14**.

In the case of such a gas cylinder **24**, when the wire rope **14** is pulled, the gas **24***d* within the cylinder **24** is compressed and generates a repellent force.

In the foregoing example, the rod **13**, attached across the entire width-wise direction in the vicinity of the forward end of the door body **12**, is guided by the guides **18***a*. However, as shown in FIG. **8**(*a*), a wheel **19** may be attached to a portion which comes into contact with the rod **13** and the guides **18***a*. Moreover, as shown in FIG. **8**(*b*), the wheel **19** attached to the rod **13** may be guided by a rail **18***b*.

Moreover, in the foregoing example, the rod **13** was attached across the entire width-wise direction in the vicinity of the forward end of the door body **12**, but, as shown in FIG. **9**, the rod **13** may be attached only at the two sides of the door body **12**. In this case, the wheel **19** may be attached to the portion which comes into contact with the rod **13** and the guides **18***a*, as shown in FIG. **9**(*b*).

In the foregoing example, a wire rope **14** was used, but a rope may be used which is made from a fiber, such as a polyamide fiber, a polyester fiber, a polyethylene fiber, a polypropylene fiber, an aramid fiber, a polyarylate fiber, a high-density polyethylene fiber, or the like.

In the foregoing example, the floating flap gate had a door body **12** formed from a single floating body, but a floating body connection-type flap gate may be used wherein a plurality of floating bodies are connected in a direction of height.

In the foregoing example, the auxiliary force generating means **20** is installed in the holding space **15***a* within the door bumpers **15**, but it may be installed outside of the door bumpers **15**.

In the foregoing example, the guides **18***a* are disposed outside of the door bumpers **15**, but they may be disposed within the door bumpers **15**. Moreover, if a bottom hinge structure makes it possible for the door body **12** to swing downwards with the bottom hinge at the center, then it is not necessary to provide the guides **18***a* to the door bumpers **15**.

In the foregoing example, the auxiliary force generating means **20** touched bottom at the support plates **15***c*, but the support plates **15***c* are not necessarily required structural elements.

The invention claimed is:

1. A floating flap gate which is disposed at an opening or at an access way, so as to block the opening or the access way when water flows in, the floating flap gate comprising:

a door body with a forward end which is able to swing upwards, in a direction in which the water flows in and within a plane in a height direction, around a base end thereof serving as a fulcrum; and

an auxiliary force generating means attached to one end of a rope, the other end of which is attached to the door body, the auxiliary force generating means comprising:

a counterweight inside which is formed a space,

an elastic member disposed in the space within the counterweight, so that when a compressive force operates, the elastic member reacts to the compressive force, and tries to return to its original state, and

a presser plate connected to the one end of the rope passing through a central portion of the elastic member disposed within the space via a hole formed in a ceiling of the counterweight, the presser plate being brought into contact with a lower surface of the elastic member to cause the compressive force to operate on the elastic member.

2. The floating flap gate according to claim **1**, wherein the elastic member is a compression spring.

3. The floating flap gate according to claim **1**, further comprising a height position adjustment mechanism for adjusting the height position at the highest point of the auxiliary force generating means, making it possible to adjust the initial auxiliary force of the elastic member.

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